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Final Paper on Study and Design of Yavatmal-Nanded District

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ABSTRACT: In this project we have aim to join rural area of Yavatmal District to surrounding urban area like Wardha & Nanded. This project led to overall development of Yavatmal District and smooth transportation between three major Districts, this rout provides direct connectivity between Nagpur and other District in Vidarbha Region & Marathwada Region. Present study is use to provide service gap in terms of expectation of passengers & service delivered by train, for that we are trying various three routs of railways by joining the villages by considering various aspect like time duration, location, regional importance and tourist spots. After all study we are finalized the rout which fulfill maximum aspects This route gives ease of transportation, comfortable & cheapest service as compare to other travelling facility like good transport, food facility, tourism & Service Parking lots of operation other service. As Yavatmal District known as Cotton City of Maharashtra and District has many Sugar and various Industries.

Keywords: - Railway lines, geographical Survey, Indian Railway, Employment, Rural Development

1. INTRODUCTION

Present study is use to provide service gap in terms of expectation of passengers & service delivered by train, for that we are trying various three routs of railways by joining the villages by considering various aspect like time duration, location, regional importance and tourist spots. After all study we are finalized the rout which fulfil maximum aspects. We did review of Literature of railway development by Different author we make City profile of Yavatmal city to ensure population and need of railway station This route gives ease of transportation, comfortable & cheapest service as compare to other travelling facility like good transport, food facility, tourism & Service Parking lots of operation other service. As Yavatmal District known as Cotton City of Maharashtra and District has many Sugar and various Industries

The length of the line is 298 km with 77 km Wardha–Yavatmal section, and 221 km Yavatmal–Nanded section all bridges (2 major bridges on Yashoda river and Bhindi River and 26 minor

bridges), and at least 54 railway under bridge have to design and there will be six tunnels. The railway line would operate in six tehsils and 90 villages in Wardha, Yavatmal, Washim, Hingoli and Nanded District of Maharashtra, India. When the line is commissioned it will provide direct connectivity between Nagpur and other Districts in Vidarbha region and Marathwada region.

LITERATURE REVIEW

1. Prof. Naveen Namala He has studied on laying of track with prototype model with proper embankment, considering slopes and drainage conditions. Using AutoCAD Software, the track will be designed. The Project for design of railway track with prototype model would confirm the Indian Standard "Code Practice for Railway Track Design" ISSN-2250:2459, CP-TS-958, 959, 979, IS- 2720, IS- 2386-1963 and design had done according to the specifications and standards. The track is designed well considering the suitable sleepers and ballast and provision of slope and drainage conditions.

2. AIRF (All India Railway Men's Federation) We get information that, Railways being a strategic industry. Transportation is a key arrangement in keeping the upward monetary bustle. Train carriage lodges a crucial position in exterior carriage, moreover in a nation like India, which is not abled with much of waterways and has a greater physical infrastructure space. Train transportation has a great value country like India, mainly in view of limited resources of natural oil and rich availability of coal, a power base is easily consumable for train transportation. In the form of direct or indirect via electric or coal energy. Indian Railways has a constructive edge over motorway, being since its birth in India more energy efficient" (Operating Department, Southern Railways Website, 01/01/2021)

3. Prof. J. Sadeghi suggests about recent extensive increases in axle loads, speed and traffic volume, along with the need to improve passenger comfort and reduce track life cycle costs, have caused the subject of Track design optimization to arise. Furthermore, complementary decision support systems require a more precise analytical and mechanistic approach to meet the design needs of modern railway track systems. These aspects highlight the necessity of a thorough review and revision of the current railway track designs. In this paper, the algorithm and limitations of the current track designed approach were discussed.

4. Indian Railway Year Book, 2018-19 this book gives information that, Indian railways transportation network has played a Key role in weaving India in to a nation. This network has not only integrated markets but also people across length and breadth of the country. The facilities such as train running status and online enquiry at Indian rail.gov.in. And online ticket booking etc. is a tremendous achievement (Indian Railway Year Book, 2018-19) the paper less tickets attracts new generation more which saves time and provide better facility manufactures power cars and Pantry Cars. Fire and Smoke detection system in all newly manufactured AC coaches, Double Acting AC compartment doors in all newly manufactured AC coaches, Fire extinguishers in all newly manufactured coaches, automatic plug type doors in all newly manufactured Humsafar and Uday train coaches (Indian Railway Year Book, 2018-19)

5. **S. Alireza Seyedvakili** suggest in his paper that they give information about mixed-integer programming for the railway network design problem with a new objective function is proposed. The model considers development projects (new line construction and existing line improvement), available budget, block capacity, and origin-destination matrix demand. The objective function is to minimize the total cost of direct and indirect (external) costs. We add the effect of railway network development on the road network to the model. The model can formulate the Predicted demand Capacity constraints and available budget are included and make the model a perfect decision support one. To evaluate the efficiency and effectiveness of

the proposed model, it is implemented for the Iranian railway network. The result led to the selection of various projects (new lines and added capacity projects) to carry the projected demand. Modelling, solving the case study, and conducting sensitivity analysis showed the high performance of the proposed model.

6. Bhanot and singh 2014 studied the performance of the container business of IR using DEA. They claim that efficiency with CONCOR has fluctuated between 87.5% and 100%. The reasons for such fluctuations, as per the authors, are the haphazard usage of infrastructure, such as the number of terminals and the number of yard equipment, without giving attention to the actual requirements. The authors suggest that norms should be formulated to enhance efficiency. Deshpande and Weisskopf (2014) have checked whether affirmative action reduces the productivity and efficiency of IR.

7. Bhatia and Sharma (2021) Conducted a study on 'Expense-based performance analysis and resource rationalisation: case of Indian railways' to assess the efficiency rating of each zone of IR and find out the benchmarking zones for the purpose of facilitating the inefficient zones to the high-performance IR zones. For the study, the authors applied variable return to scale and constant return to scale data-envelopment methods. The study finds eight railway zones to be efficient in the CRS model and thirteen railway zones to be efficient in the VRS model. The study further asserts that there is the deployment of surplus staff in some zones which needs to be shunted to other departments of IR. In addition to that, the staffs need to be made multi-skilled, and zonal railways restructured. The authors also suggest IR to formulate strategies to rationalise resources.

8. George and Rangaraj (2008) did a benchmarking study of the zones of IR in pursuit of developing an alternative approach to measure the performance of IR from the perspective of the supply chain. They employed data envelopment analysis for the purpose of the performance appraisal. The study finds that the performance of the central and western zones is excellent, whereas other zones, including the east coast, north central, and south east central, have also performed satisfactorily, though not at par with the central and western zones. The conditions of some of the rest zones, including been fragile. However, the authors find that there eastern, north east frontier; northern, southern, and south central, have is much scope for improvement in their efficiency.

9.Deshpande and Weisskopf (2010) undertook a study to find out whether the long-running policies of reservation are negatively affecting the productivity of IR. Though the inefficiency argument is often put forward whenever there is a case of reservation in an organisation (Thorat et al., 2016), the findings of Deshpande and Weisskopf (2010) negate the prejudice against reservations in IR and defy the claims that representation of a marginalised section of society in IR comes at the cost of productivity and efficiency. Contrary to the ingrained mindset that affirmative action in IR recruitment has brought about inefficiency in the system of IR, the authors find that the opposite is true in the case of IR, and the same was buttressed at other places in the work of Deshpande and Weisskopf (2014, 2016).

10. **Vaidya (2018)** proposed an approach for 'on-time' performance appraisal of IR. The approach which the author used in the study is based on six-sigma computation. Six Sigma is applied to 'improve process effectiveness' (Adeodu et al., 2021). The proposed approach to performance appraisal goes far beyond the conventional DMPO approach and has been validated by using various data sets. This is an extension to the existing sigma computation and can compute the sigma level for any unruly data as well. Anand and Gupta (2018) in their case study of the productivity of IR with special reference to New Delhi Railway Station, find that the handling capacity of passengers at railway stations is poorer than in European countries. The stations are incapable of using the land resources to their fullest capacity, and

buildings are under-utilised too. The stations suffer from some additional problems, such as the lack of hold-up areas for crowd management and the lack of proper guidelines for passengers regarding the carriage of belongings.

11. **B.K.Vishwanath and S.Sudheer** studied the pier cap(deck beam) is designed as a cantilever on a pier and cap looks like a hammer. The Pier is designed forthe axial dead load and live load from the slab, girders, deck beam. The pier is designed for two lane bridge loaded with IRC Class AA tracked vehicle. Foundation designed as footing for the safe load bearing in thesoil.All the elements are designed by using M25 grade concrete and Fe415grade steel. Designs are based on Working stress and Limit state method as per IRC: 21-2000 and IS: 456-2000.

2. METHODOLOGY

- We took various sample of various part of Yavatmal district and made various test on soil sample like specific gravity, consistency limit/atterbergs limit, water content, density or unit weight of soil, dry density, porosity, void ratio etc.
- We are surveying & studying the various contour & Terrain map of Yavatmal District for suitable Railway track. After detail study of terrain, we try to design three Various tracks by using different aspect like Distance coverage, time duration, tourist place, religious place. etc that's shows in map 1, 2 & 3.

MAP 1

we are trying to Join Darwha - Digras - to Mahur - Mahagaon - Umarkhed & so on Up to Nanded" but after detail study we noticed that the Distance will increase by 36 km & we need to provide two bridges on Painganga river which will Increase cost of project and in this route, we Can't connect middle city of Yavatmal District i.e. Pusad.

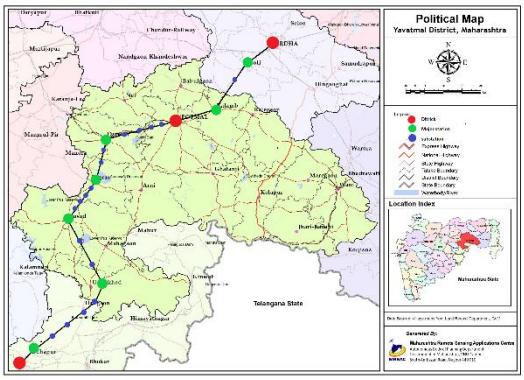

Fig.2 Map No. 1

MAP 2

we are trying to Join Darwha, Digras, Pusad to Mahagaon Umarkhed & so on to Nanded. After detailed study we know that after joining this track we can join maximum Area of Mahagaon taluka which is underdeveloped & this Route will reduced the Distance for Mahur which is holly & Religious place for Hindu. But In this track also there are hilly Range between Mahagoan and Umarkhed so we have to provide tunnels in it. But by using this route we can save the jungle area between the Pusad and Umerkhed but this Route Increase the Distance by 14 km as compared to map 3.

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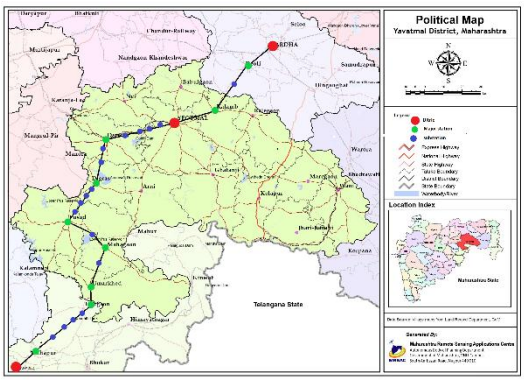

Fig. 3 Map No. 2

MAP 3

we are trying to Join Darwha Digras - Pusad - Umarkhed & so on to Nanded but After detailed study on the terrain we knows that between Pusad & Umarkhed has big hilly as well as Jungle Area as compared to Map-2, also we a Unable to reach maximum are of Umarkhed & Mahagaon taluka , though this Route Reduce 14km as compare to map 2.

After All Study on Map we are assume to finalize the map no. 2 as it has maximum reach to Yavatmal District, has Religious Important, tourist part and Industrial Area like Sugar Industry.

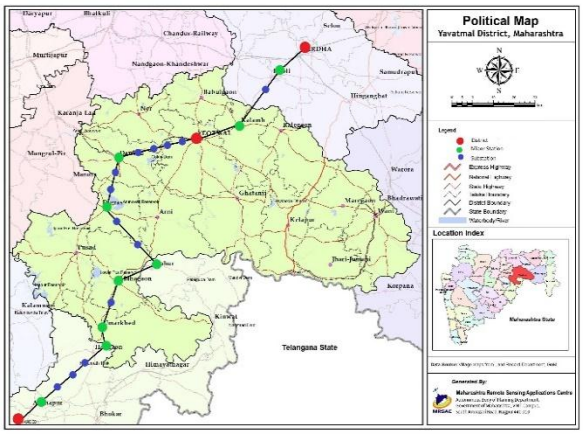

Fig.4 Map No. 3

OBSERVATION AND CALCULATION

Determination of Specific Gravity by Pycnometer

Sample A

Table No. 4.1.1 Observation table of specific gravity for sample

Sr.No.	Sample	I(gm)	II(gm)
1.	Wt. of pycnometer(W1)	717	654
2.	Wt. of pycnometer + oven dried soil (W2)	917	854
3.	Wt. of pycnometer + oven dried soil + Water (W3)	1607	1537
4.	Wt. of pycnometer + full of water (W4)	1479	1412
5.	Wt. of oven dried soil	200	200

6.	Wt. of water filling pycnometer (W4-W1)	762	758
7.	Wt. of water in pycnometer over and above dry soil (W3-W2)	687	684
8.	Wt. of water having same volume of dry soil (W4-W1)-(W3-W2)	75	74
9.	Specific gravity (G)=(W2-W1)/(W4-W1)-(W3-W2)	2.66	2.66

The average of sample I and II = $\frac{2.66+2.66}{2}$

= 2.66

Hence, the specific gravity of sample A is found to be 2.66

Sample B

Table No. 4.1.2 Observation table of specific gravity for sample B

Sr. No.	**Sample Name**	**Wt. Of Container (Gm.) W1**	**Wt. Of Wet Soil + Container Gm./Cc W2**	**Wt. Of Dry Soil After 24 Hr Gm./Cc W3**	**Moisture Content (%) W2-W3 / W3-W1 X10**
1	Sample-A	47	76	73	11.5
2	Sample-B	45	75	72	10.7
3	Sample-C	46	75	72	11.5

Sr. No.	**Sample**	**I (gm)**	**II (gm)**
1.	Wt. of pycnometer(W1)	656	656
2.	Wt. of pycnometer + oven dried soil (W2)	856	856
3.	Wt. of pycnometer + oven dried soil + Water (W3)	1680	1679
4.	Wt. of pycnometer + full of water (W4)	1563	1563
5.	Wt. of oven dried soil (W2-W1)	200	200
6.	Wt. of water filling pycnometer (W4-W1)	907	907
7.	Wt. of water in pycnometer over and above dry soil (W3-W2)	824	825
8.	Wt. of water having same volume of dry soil (W4-W1)-(W3-W2)	83	82
9.	Specific gravity (G)=(W2-W1)/(W4-W1)-(W3-W2)	2.40	2.43

The average of sample I and II = $\frac{2.40 + 2.43}{2}$

= 2.415

Hence, the specific gravity of sample B is found to be 2.415

Moisture Content
Initial water content present in the sample

Table No. 4.2.1Observation table for moisture content

Liquid Limit Test

Table no. 4.3.1 Observation table of liquid limit for Sample A

Sr. No.	**No. Of Blow S**	**Wt. of Container (Gm.) W1**	**Wt. Of Wet Soil + Container Gm./Cc W2**	**Wt. of Container + Dry soil After 24 Hr. (Gm) W3**	**Wt. Of Water Gm.**	**Wt. Of Dry Soil (Gm.)**	**Moisture Content (%)**
1	24	45	56	53	3	8	37.5
2	29	44	56	53	3	9	33.9
3	38	47	57	55	2	8	40.00

(25 blows for sample A is 36.9%)
Hence, the value of liquid limit for sample A is 36.9%

For Sample – B

Observation table liquid limit for Sample B

Sr. No.	**Wt. of Container (Gm.) W1**	**Wt. Of Wet Soil + Container Gm./Cc W2**	**Wt. of Dry soil + Container After 24 Hr. (Gm) W3**	**Wt. Of Water Gm.**	**Wt. Of Dry Soil (Gm.)**	**Moisture Content (%)**
1	50	57.95	56.75	1.2	4.61	26.03
2	50	60.03	58.28	1.75	6.14	58.5
3	50	58.3	57.23	1.07	5.09	21.02

Sr. No.	**No. Of Blow S**	**Wt. of Container (Gm.) W1**	**Wt. Of Wet Soil + Container**	**Wt. of Container + Dry soil**	**Wt. Of Water Gm.**	**Wt. Of Dry**	**Moisture Content (%)**

			Gm./Cc W2	**After 24 Hr. (Gm) W3**		**Soil (Gm.)**	
1	18	50	70	63	7	13	53.84
2	27	50	68	62	6	12	50
3	40	50	66	61	5	11	45.45

(25 blow for sample B 53.8 is %)
Hence, the value of liquid limit for sample B is 53.8%

4.4 Plastic Limit Test
For Sample – A
Table No. 4.4.1 Observation Table Plastic Limit for sample – A

Plastic Limit = avg. water Content
= 42.85+22.22+16.66
3
= 27.24%

For Sample – B
Plastic limit = avg. water content
= 26.03+28.5+21.02
3
= 25.18 %
Table No. 4.4.2 Observation Table Plastic Limit for Sample – B

4.5 Plasticity Index = Liquid Limit – Plastic Limit
=36.9-25.18
=11.72
4.6 Dry Density ($\dot{p}_d$) = $\dot{p}/1+w$
1.883
1+0.1123
= 1.69gm/cm^3

4.7 Wet Density ($\dot{p}$) = W/V
2174
1954.53
=1.883gm/cm^3
4.8 Void Ratio
Void Ratio (e) = G r_w /□
= 2.66*9.81
1.883
=14.32%
4.9 Degree of Saturation = wG
=0.1123*2.66
=54.81%

3. RESULT AND DISCUSSION

TUNNELS In route there are 5 tunnels in route in which 3 are majors and 2 are minors tunnels

First major tunnel located near Yavatmal city behind Darda Airport having length of 1.5Km
Second major tunnel located near Umarkhed (Nandgavhan) having approximate length 4km
There are 2 tunnels in Pusad in which one is Major tunnel having length Approximate 1 to 1.5km
The approximate average length of minor tunnels is from 300m to 1.5km
Tunnels Dimension:-

Width = 3.75m
Height = from Edgeline 4.3m
= from centreline 5.6m

EMBANKMENT

Embankment Dimension =

Height= 3.5m
Width = 3.5m on top
= 6m on bottoThe embankment are provided with a 1:2 or 1:1.5 (V: H) side slope

LOAD

1.92, 2.04, 1.97, 1.95 tons/foot

RIVER

RIVER	**LOCATION**	**SPAN**	**HEIGHT**
PUS RIVER	MAHAGAON	744m	42 m
PUS RIVER	PUSAD	744	42
ARUNAVATI	HARSUL	470	45m
YASHODA	WARDHA	750 m	50 m
ADAN	DARWHA	350 m	48 m
BHIDI	BHIDI	300 m	36m
SHIRPUR	WARDHA	450 m	50 m

DIFFERENCE BETWEEN TWO ROUTES

1^{ST} Route	2^{ND} Route
Few tourist place like kalamb	maximum tourist place like Mahur, hiwarasangam, kalamb
Minimum villages are connected	Maximum villages are connected
11 river	11 river
6 tunnel	5 tunnel
Industrial area = one closed	Industrial area = one open
Forest area is same	Forest area is same
284 km	298 km

COLUMN DESIGN:-

Design of column is calculated as per followed method

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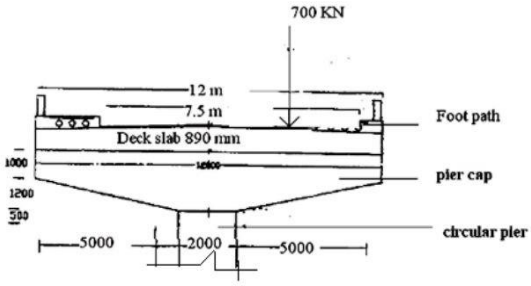
Deadloadmoment



Considering one meter width of cantilever slab the dead load moment at the fixed end of the cantilever is computed considering the self-weight of slab, kerb, parapet and railings.

TABLE 7.1 CALCULATIONS OF MOMENTS

SR. NO.	Dimensions of structural element	Load(KN)	Lever arm (m)	Moment (KN-m)
1	Hand rails (lumps 4 m)	2	2.75+(2.25-0.075) = 4.925	9.85
2	R.c.c posts = (0.15×0.15×1×24)	0.54	4.925	2.6595
3	Kerb = (2.25×0.3×24)	16.2	+2.75 =3.875	62.775
4	wearing coat = (2.75×0.075×24)	4.5375	=1.375	6.23
5	R.C.C deck slab = (0.89×5×24)	106.8	5/2 = 2.5	267
6	Triangular portion ofhammer head (pier cap) =×1.2×5×24	72	5/3 = 1.67	120.24
7	Rectangular portion of hammer head (pier cap) = 1×5×24	120	5/2=2.5	300

Total dead load moment (Mg) = 9.85+ 2.6595+ 62.775+6.23+267+120.4+300 = 768.7795 KN-m.

Live load moment

The live load is IRC class AA tracked vehicle. This is placed with its edge 1200 mm from the kerb.

$$A_{st} = \frac{maximum\ bending\ moment}{\sigma st \times j \times d} = \frac{1580.38 \times 10^6}{200 \times 0.91 \times 2150} = 4038.79\ mm^2 = 4039\ mm^2$$

Use 25mm ø bars

Effective width of dispersion perpendicular to span is given by be= 1.2x +bw x is the distance of center to gravity of the concentrated load from the face of the cantilever support.

bw = The breadth of the concentration area of the load i.e; the dimension of the track contact area over the road surface of the slabin the direction parallel to the supporting edge of the cantilever plustwice the thickness of the wearing coat or surface finish above the structural slab.

be= 1.2×x+bwX= 0.1m
bw = [0.85+2×0.075]=1m.
Therefore be= (1.2×0.1)+1 = 1.12m. Live load per meter width including impact =(770×2)/1.12=1375KN. Design live load moment (Mq) = 1375×0.1 = 137.5 KN-m.

5: Design moment
Design moment =M=(M+M) =768.7795+137.5 =906.2795 KN-m.
Factored moment = 906.2795×2.1=1903.18 KN-m.

6: Reinforcements
Effective depth required
Qbd^2 =maximum bending moment

Effective depth required =2200-50 = 2150 mm > 1580.38 mm Hence adopted depth is adequate.

$$a_{st} = \frac{\pi \times d^2}{4} = 490.87 \text{ mm}^2$$

$$\text{Number of bars} = \frac{4039}{490.87} = 8.22 \cong 9 \text{ no.s} 8 \text{ mm}.$$

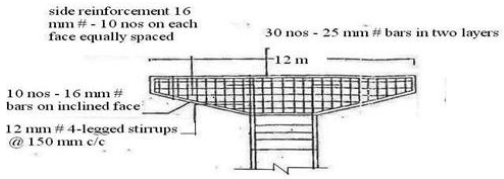
However provided more effective more reinforcement than required.

Top reinforcement:
Provide 30 numbers of 25mmø bars in 2 layers

Side reinforcement:
Provide 10 numbers of 16mm ø bars on each face equally spaced.

Inclined reinforcement:
Provide 10 numbers of 16mm øbars on each face equally spaced.

Shear reinforcement:
Provide reinforcement 12mm ø 4-legged stirrups @ 150 mm\cc.



REINFORCEMENT DETAILS IN HAMMER BED BLOCK
Live load: IRC Class AA tracked vehicle Materials: M20 grade concrete and Fe 415 steel

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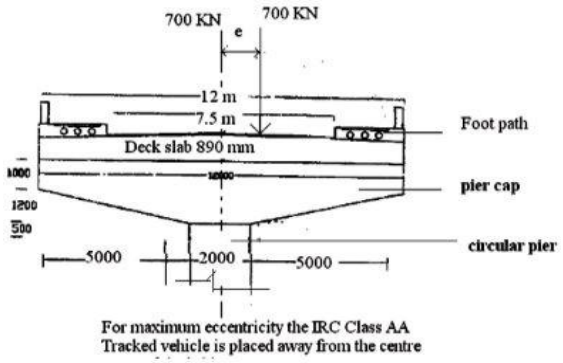
1. Calculation of loads



Weight of

1. Parapet railing = (2×0.7) = 1.4 KN/m
2. Wearing coat = (0.075×7.5×22) = 12.375 KN-m
3. Deck slab = (0.89×12×24) = 256.32 KN-m
4. Krebs = (2×0.3×2.25×1×24) = 32.4 KN-m
5. Dead load of pier cap

The pier cap is divided into two cantilevers and one rectangular section Weight of two trapezoidal sections = area × unit wt of concrete

$$= 2\times\frac{(1+2.2)}{2}\times 5 \times(25) = 400 \text{ KN-m}$$

Weight of rectangular portion = (2×2.2) × 25 =110 KN-m
Therefore total weight of pier cap = 400+110 = 510 KN-m

$$\text{Dead load of circular pier} = \frac{\pi\times 2^2}{4}\times 8.062\times 25 = 633.18 \text{ KN-m}$$

Weight of IRC Class AA tracked vehicle is 700 KN Total load = dead load + live load = 1445.675+700 = 2145.675 KN
Total load with impact = 2145.675×2= 4291.35 KN
By considering dynamic effects such as wind load, longitudinal forces due to tractive effort of vehicles and longitudinal forces due to braking of vehicles a suitable factor of safety is made
Factor of safety = 2 Factored load = 4291.35×2 = 8582.7 KN
Factored load Pu=8582.7 KN
If vehicle is moving away the center of the bridge moment is induced.
e is the eccentricity of the wheel load from center. e = 1.1m
Live lsoad = 700×2 = 1400 KN Maximum moment = 1400×1.1 = 1540 KN Moment with impact = 700×1.1= 1400 KN Factored moment = 1540×2.2 = 3388 KN-m Therefore factored moment = Mu = 3388 KN-m

2. Non Dimensional Parameters

$$\frac{P_u}{f_{ck}D^2} = \frac{8582.7*10^3}{20*2000^2} = 0.1$$

$$\frac{M_u}{f_{ck}D^3} = \frac{3388*10^6}{20*2000^3} = 0.02$$

$$\text{Ratio } (\frac{d}{D}) = \frac{60}{2000} = 0.03$$

Where D is the diameter of the circular pier = 2000 mm d is the clear cover = 60 mm

By referring chart number of 55 of SP 16

Where P is the percentage of steel reinforcement

P = 0.01*20 = 0.2

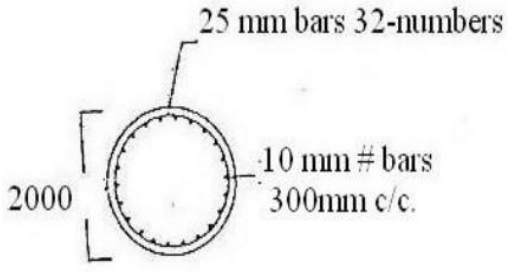
$$\text{Area of steel} = \frac{P*\pi*D^2}{400} = \frac{0.2*\pi*2000^2}{400} = 6283.18 \text{ mm}^2$$

Use 25 mm φ bars

$$a_{st} = \frac{\pi*25^2}{4} = 490.87 \text{ mm}^2$$

$$\text{Number of numbers} = \frac{6283.18}{490.87} = 12.8 \text{mm}^2$$

However provide 32 numbers of 25φ mm bars around the circular pier.
Using 10 mm φ lateral ties Spacing is the least of the following
1. Least lateral dimension = 2000 mm 2. 16×25 = 400 mm
3. 300 mm
Hence provide 10 mm ø bars of lateral ties @ 300 mm c/c.



PLAN OF CIRCULAR PIER

BENEFITS OF RAILWAY IN YAVATMAL DISTRICT

- The transportation of fruits and vegetables by the Kisan Rail is granted a subsidy of 50% on the tariff chargeable by the Ministry of Food Processing and Industries. The farmers get this subsidy amount immediately which is beneficial to them.
- To increase the income in the farm sector by connecting production centres to markets as well as consumption centres.
- Also in Yavatmal District is known as cotton city it is good carrier. Also the good carrier for cotton and sugarcane.
- And also the lot of factory of cotton and sugar mills in Yavatmal District it is very easy to carrying goods to other District and states.
- The greatest advantage of the railway transport is that it is the most dependable mode of transport as it is the least affected by weather conditions such as rains, fog etc. compared to other modes of transport.
- The rail transport is better organized than any other form of transport. It has fixed routes and schedules. Its service is more certain, uniform and regular as compared to other modes of transport.
- Its speed over long Distances is more than any other mode of transport, except airways. Thus, it is the best choice for long Distance traffic.
- Railway transport is economical, quicker and best suited for carrying heavy and bulky goods over long Distances.
- It is a cheaper mode of transport as compared to other modes of transport. Most of the working expenses of railways are in the nature of fixed costs. Every increase in the railway traffic is followed by a decrease in the average cost. Rail transport is economical in the use of labour also as one driver and one guard are sufficient to carry much more load. than the motor transport.
- Railway is the safest form of transport. The chances of accidents and i breakdowns of railways are minimum as compared to other modes of transport. Moreover, the traffic can be protected from the exposure to sun, rains, snow etc.
- The carrying capacity of the railways is extremely large. Moreover, its capacity is elastic which can easily be increased by adding more wagons.

SCOPE OF FUTURE WORK

1. This Railway track would operate in six tehsil and 90 villages in Wardha, Yavatmal, Washim, Hingoli, and Nanded District of Maharashtra, India.
2. When line is commissioned it will provide direct connectivity between Nagpur and other District in Vidharbha region and Marathwada region.
3. After completion of this project rural talukas and villages will be help to developed fast.
4. Advantage for rickshaw drivers.
5. Advantage and employment for small venders.
6. Future growth in import and export.
7. As Yavatmal is cotton city of Maharashtra, there will lot of chances of development in cotton market of Yavatmal District.
8. As Yavatmal having only one mode of transportation that is road transportation, Railway transportation will reduce rush of vehicles and provide smooth transportation.
9. The employment in Yavatmal District will rise as Railway route comes in Yavatmal District.
10. The market will enhance by early decaying fruits and vegetables can transport fatly by train it will beneficial to farmer.

4. CONCLUSION

After study & designing the Wardha-Yavatmal- Nanded Railway track we are assuming that, the time duration between these cities Reduced by 30 to 40%. After doing Surveying we get Information that for completing this project, we need to build two major bridges on Yashoda River & Bhindi River with 26 minor bridges. The total length of track probably will be 298 km having 77km Wardha- Yavatmal & 221km from Yavatmal-Nanded. As Yavatmal District having some hilly Area so we need to Design 6 tunnel and 54 Underpasses. After Surveying and Analysing we suggest that Railway track may follow track. Wardha - Deoli - Bhindi - kalamb- Talegaon- Yavatmal – Darwha – Pusad - Mahagaon - Umarkhed – Hadgaon – Ardhapur - Nanded. If this project will complete their will be lots of employment enhancement in Yavatmal District. In Yavatmal only Road transportation facility is available & having very big Rush at Government & private, buses & taxis, this project will help to make convenient transportation. We are assuming that this project will enhance Infrastructure of Yavatmal in very short time

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